



Influence of patient position on the Success of Inferior Alveolar Block Anesthesia.

A cross-sectional study in Al-mustansiriyah Dental School,
Baghdad

Dr. Faaiz Alhamdani. PhD.

Dr. Mustafa Sabah. BDS.

Abstract

Introduction: Despite the wide use of Inferior Alveolar Nerve Block anaesthesia in dentistry it has a high percentage of failure (10 to 20%). This failure rate represents a challenging clinical problem in the management of mandibular teeth. There have been several explanations for this problem. Some authors believe that incorrect localization of the nerve near the mandibular foramen is the main problem with subsequent improper localization of the needle. Despite the attention paid to the different possible reasons for Inferior Alveolar Nerve Block, the patient position and its influence on the operator's position and subsequently on the success of the technique did not get enough attention.

Aim of the study: To determine the influence of patient's position on the failure rate of Inferior Alveolar Nerve Block anaesthesia.

Materials and Methods: Patients attended Oral Surgery Department, College of Dentistry, Almustansiria University in Baghdad for dental extraction were included in this study. Dental extraction procedures were performed by 4th and 5th class students. Inclusion criterion for the students was: students who perform the anaesthetic injection technique without the help of the supervising staff member.

Results: Fifty seven students were included in this study, 21(36.8%) were males and 36 (63.2%) were females. Fifty seven students performed the local anaesthesia. Twenty four students were from 4th year (42.1%), and thirty three (57.9%) from 5th year.

Chi-Square Test showed highly significant relationship between patient's position and the success of Inferior Alveolar Nerve Block ($p < 0.01$, $df=1$). Chi-Square Test showed no significant relation ($p > 0.05$, $df=1$) between the success level of anaesthesia and the student's year.

Conclusion: Patient position is one of the factors that could influence the success of IANB anaesthesia. Considerable deviation from the accurate chair angulation can increase the chance of failure of IANB.

Key words: Inferior alveolar nerve block, failure of local anaesthesia, patient's position.

Introduction

Successful local anesthesia is the ground of pain control in dental practice. It is also important to reduce fear and anxiety associated with dental procedures [1]. One of the most widely used local anesthetic techniques is the inferior alveolar nerve block (IANB). Inferior alveolar nerve block (IANB) is a technique used to produce anesthesia of the mandibular teeth, gingiva of the mandible, and the lower lip. This procedure anaesthetizes the IANB prior to entering the mandibular foramen [1-3].

Despite the wide use of IANB in dentistry it has a high percentage of failure. Many studies demonstrated significant failure level (10 to 20%) of inferior alveolar nerve block technique in both conservative and surgical procedures [1, 4-6]. This failure rate represents a challenging clinical problem in the management of mandibular teeth [4, 6]. This could be the reason for considering this anaesthesia technique a technically difficult [5].

There have been several explanations for this problem. Some authors believe that incorrect technique (localization of the nerve near the mandibular foramen) with subsequent improper localization of the needle is the main problem [6-10].

Others believe that failure of achieving anaesthesia may be related to accessory innervations for mandibular teeth from other nerves. Additional innervation from Mylohyoid nerve in particular, is the reason for the failure of IANB [7, 11-13].

Others argued that absence of definite bony landmark due to variation in the position of mandibular foramen with the variation in length and width of mandibular ramus is the

main reason for failure of IANB [7, 11, 14, 15]. Some authors speculated that anaesthetic solution, when deposited, migrates within the fascial plans through the pterygomandibular space following the line of least resistance and deviates away from its target [11].

Despite the attention paid to the different possible reasons for IANB, the patient position and its influence on the operator's position and subsequently on the success of the technique did not get enough attention.

Aim of the study

To determine the influence of patient's position on the failure rate of IANB anaesthesia.

Materials and Methods

Patients attended Oral Surgery Department, College of Dentistry, Almustansiria University in Baghdad for dental extraction were asked to participate in this study and consented. Dental extraction procedures were performed by undergraduate 4th and 5th year students. All local anaesthesia injections completed with the presence of the same training staff member. The used local anaesthetic solution was Lidocain 2% with 1/100 000 Epinephrine (Lignocaine Special[®]). The success criterion for the technique of injection was numbness of lower lip in the anaesthetized side [3].

The followed protocol for IANB is to be performed by placing the operator thumb at the deepest concavity of the ascending ramus and the index finger is placed at the same level extra-orally on the posterior border of the ramus. The introduction point for the needle is the midway between upper and lower border of the thumb nail. The needle is advanced

parallel to the lower occlusal plane where the dentist places the thumb intra-orally at the deepest concavity of the anterior ascending ramus and the index finger at the same height extra-orally on the posterior aspect of the ramus. The needle is advanced from the lower premolar on the opposite side with approximately 45° parallel to the lower occlusal plane. The puncture point is half-way between the mid-points of the thumb nail. 1.5 milliliter of solution is deposited after a bony contact is felt [16].

The time chosen to conduct the research was the first term of the year. The reason was to enable the researchers to identify the common errors in students' performance earlier in the training year.

Students data included in this study was: name, year (4th or 5th), gender, standing student position (correct, incorrect), and the success of local anaesthesia (as judged by the staff member). Incorrect student position implies to the presence of abnormal body maneuver; such as excessive or twisting of the back and/or over lifting of the shoulders. The success of local anaesthesia was judged by lip numbness.

Patient's information included was: patient's age, gender and patient's position (correct/ incorrect). Patient's position was judged according to the angle and height of the chair. Correct chair angle, according to the adopted criteria in Iraqi Dental School, is as follows: Patients undergoing extraction of upper teeth are positioned with their mouth level with the operator's elbow. The dental chair reclined so that the upper arch lies is within an angle of almost 60 degrees to the floor. In case of extraction of lower teeth, the chair should be lower than the level of operator's elbow, and reclined slightly less (angle more than 60 degrees) so that the lower arch is parallel to the

floor [17]. Obvious deviation from the correct angle and/or height is considered as incorrect patient's position.

Obvious shift from both correct chair angle and/or height result in excessive bending or twisting of the student's back and/or over lifting of the student's shoulder. In another word, incorrect patient's position will enforce the student to use wrong maneuvering and perform the anaesthesia technique uncomfortably.

Inclusion criteria for the patients were: patients who have no history of systemic diseases and agreed to participate in the study. Inclusion criterion for the students was: students who perform the anaesthetic injection technique without the help of the supervising staff member.

Results

Fifty seven students were included in this study, 21(36.8%) males and 36 (63.2%) females. Twenty four students were from 4th year (42.1%), and thirty three (57.9%) from 5th year. Out of 57 patients included in the study, 30 (52.6%) were males, and 27 (47.4%) were females. The age range for the included patients was 15-70 years (Mean 38, STD 14.51108).

IANB technique was successful with (62.5%) of students from the 4th year. Whereas, successful technique was reported with (60.6%) of students from the 5th year. Chi-Square Test showed no significant relation ($p>0.05$, $df=1$) between the success level of anaesthesia and the student's class (fig. 1).

The number of students operated with wrong patient position was 43(75.4%). 17 (29.8%) students performed their injection technique with wrong chair height, while 26 (45.6%) students did the injection with wrong chair angle. As shown in table 1

the highest number of wrong patient position, almost half of the cases, found in lower chair angle, were the chair angle was less than 45 degrees. The lowest percentage of error (3.5%) in patients' position was recorded with higher chair angle, as the chair was in almost upright position.

Figure 3 reveals the number of students with accurate and inaccurate extraction positions. There is comparable percentages of 4th and 5th year students with wrong position (33.5% , 36.5%) respectively, and (66.5%, 63.5%) with correct student position. Chi-Square Test showed highly statistical significant relationship between the patient position and student position ($p < 0.01$, $df = 1$). However, it did not show significant statistical relationship between the student position and the success of IANB.

Discussion

Failure of IANB anaesthesia is not fully understood [18]. However, literature suggests that anatomical variations seem to have an important influence on the failure rate [19]. Nonetheless , literature also shows that lack of knowledge about the correct anatomical position and lack of experience with related erroneous positioning of the needle are important factors of failure [6, 20]. Trained and experienced dentists have highest success rate of IANB [20, 21]. This could explain the level of failure in the injections provided by the students in this study.

In order to achieve high success in anaesthesia the injection technique taught in Oral Surgery clinic in Iraqi dental schools is the direct technique [16]. It is suggested that direct technique is the best used method to overcome failure of IANB. In addition, success rate for inferior alveolar block

injections with lignocaine, and adrenaline, used in college departments, is more than 90% [16].

Dental students in Iraq start to learn local anaesthesia injection technique from the 3rd year. This enables them to be prepared to deliver their treatment in the 4th and 5th year. It also enable the teaching staff to address early the possible training problems.

The main reason for performing this study is related to the adopted protocol for local anaesthesia administration in Iraqi dental institutes. In this protocol the injection is given while the patient is seated in approximately the same position for dental extraction procedure. It is not usual in dental practice in Iraq to deliver local anaesthesia in supine position, as advised in some local anaesthesia text books [22]. This is probably due to the fact that vaso-vagal syncope after local anaesthesia is uncommon in Iraqi patients.

It has been noticed that the failure rate of IANB in Oral Surgery 4th and 5th year students' clinic is relatively high. Lack of adequate experience and technical mistakes are understood. However, overlooked technical errors need to be considered. One of these errors is improper chair positioning.

This study demonstrated a noticeable error in patients' position during delivery of local anaesthesia. The possible explanation for this is that student at this practicing level is more concerned about the technical details of injection. He/she is more concerned about the angulation of the dental syringe; the identification of the land marks for the introduction of the needle whether the bone contact will be achieved or not. This could make the student overlook the accuracy of patient position.

The drawback of this study was inability to record the number of pervious IANB injections performed

by the students. It is unusual to document the local anaesthetic details for managed patients in the college departments. Hence it is difficult to determine the relationship between the students' experience and the frequency of erroneous patient's position.

It is interesting, however, is that 5th year students did have the same problem of chair position with comparable percentage to 4th year students. Although the number of students in these classes is not of high statistical value, it might suggest that 5th year students were, still, unable to overcome this error. This could, also, reflect that 5th year students have the same level of concern about the technique. It worth mentioning that 5th class students in this sample, as their fellow colleagues in the 4th year work under the stress of meeting the requirement of dental extraction for final exam entry.

Absence of significant statistical relationship between student's position and the failure rate is another interesting finding. This could be explained by the fact that some students managed to perform the correct technique even with inaccurate position.

Conclusion

Patient position is one of the factors that could influence the success of IANB anaesthesia. Considerable deviation from the accurate chair angulation can increase the chance of failure of IANB.

References

- 1- Ardakani, F.E., et al., *The Position of Lingula as an Index for Inferior Alveolar Nerve Block Injection in 7-11-Year-Old Children* J Dent Res Dent Clin Dent Prospect, 2010. **4**(2): p. 47-51.
- 2- Thangavelu, K., R. Kannan, and N.S. Kumar, *Inferior alveolar nerve block: Alternative technique*. Anesthesia: Essays and Researches, 2012. **6** (1): p. 53-57.
- 3- Malamed, S.F., *Is the mandibular nerve block passé?* JADA, 2011. **142** (Supp 3): p. 3s-7s.
- 4- Raj, J.D. and S. Ramesh, *Evaluation of the anesthetic efficacy of inferior alveolar nerve blocks in dental patients - A Systematic Review* Journal of Dental and Medical Sciences, 2013. **Volume 8**(6): p. 10-17.
- 5- Singh, R.D., R. Khatter, and C.S. Bal, *The Effect of Preoperative Ibuprofen, Combination of Ibuprofen and Acetaminophen, Ketorolac Versus Placebo on the Efficacy of the Inferior Alveolar Nerve Block in Patients with Irreversible Pulpitis*. Indian Journal of Dental Sciences, 2010. **Vol. 2**(4): p. 4-6.
- 6- PALTI, D.G., et al., *Anesthetic technique for inferior alveolar nerve block: a new approach*. J Appl Oral Sci, 2011. **19**(1): p. 11-15.
- 7- Keros, J., et al., *Foramen Mandibulae as an Indicator of Successful Conduction Anesthesia*. Coll. Antropol, 2001. **25**(1): p. 327-331.
- 8- Ennes, J.P. and R.M.d. Medeiros, *Localization of Mandibular Foramen and Clinical Implications*. Int. J. Morphol., 2009. **27**(4): p. 1305-1311.
- 9- Galbreath, J.C., *Tracing the course of the mandibular block injection*. Oral Surg Oral Med Oral Pathol, 1970. **30**(4): p. 571-82.
- 10- JM, B. and S. MS, *Mandibular block injection: a method of study using an injected radiopaque material*. J Am Dent Assoc 1962. **65**: p.:736-745.
- 11- Reader, D.A., *Studies Evaluating Mechanisms of Failure with the Inferior Alveolar Nerve Block* A.A.o. Endodontists, Editor. 2009, American Association of Endodontists: Chicago.
- 12- Frommer, J., F.A. Mele, and C.W. Monroe, *The possible role of the mylohyoid nerve in mandibular posterior tooth sensation*. J Am Dent Assoc, 1972. **85**(1): p. 113-7.
- 13- Wilson, S., P. Johns, and P.M. Fuller, *The inferior alveolar and mylohyoid nerves: an anatomic study and relationship to local anesthesia of the anterior mandibular teeth*. J Am Dent Assoc, 1984. **108**(3): p. 350-2.
- 14- Nicholson, M., *A study of the position of the mandibular foramen in adult human mandible*. Anat Rec, 1985. **212**(1): p. 110-2.

- 15- K. Thangavelu, et al., *Significance of localization of mandibular foramen in an inferior alveolar nerve block*. Journal of Natural Science, Biology and Medicine, 2012. **3**(2): p. 156-160.
- 16- Meechan, J.G., *How to overcome failed local anaesthesia*. Br Dent J, 1999. **186**(1): p. 15-20.
- 17- Hupp, J.R., ed. *Principles of Uncomplicated Exodontia*. 5th ed. Contemporary Oral and Maxillofacial Surgery, ed. J.R. Hupp, E.E. III, and M.R. Tucker. 2008, Mosby, Elsevier.
- 18- Potocnik, I. and F. Bajrovic, *Failure of inferior alveolar nerve block in endodontics*. Endod Dent Traumatol, 1999. **15**(6): p. 247-51.
- 19- Rood, J.P., *Some anatomical and physiological causes of failure to achieve mandibular analgesia*. British Journal of Oral Surgery, 1977. **15**(1): p. 75-82.
- 20- Keetley, A. and D.R. Moles, *A Clinical Audit into the Success Rate of Inferior Alveolar Nerve Block Analgesia in General Dental Practice*. Primary Dental Care, 2001. **8**(4): p. 239-142.
- 21- Ajarmah, J.A., et al., *Operators Experience and the Success Rate of Inferior Alveolar Nerve Block Anesthesia*. Pakistan Oral & Dental Journal 2013. **33**(1): p. 137-140.
- 22- Malamed, S.F., ed. *Techniques of Mandibular Anesthesia*. 6th ed. Handbook of Local Anesthesia, ed. S.F. Malamed. 2013, Elsevier Health Sciences: St. Louis, Missouri

Table 1 number of cases with each erroneous chair position

Incorrect patient position	No. of cases	% (from 57 cases)	Successful	Unsuccessful
Higher chair position	6	10.5	3	3
Lower chair position	11	19.2	4	7
Higher chair angle	24	42.1	9	15
Lower chair angle	2	3.5	1	1
Total no.	43		17	26

List of figures:

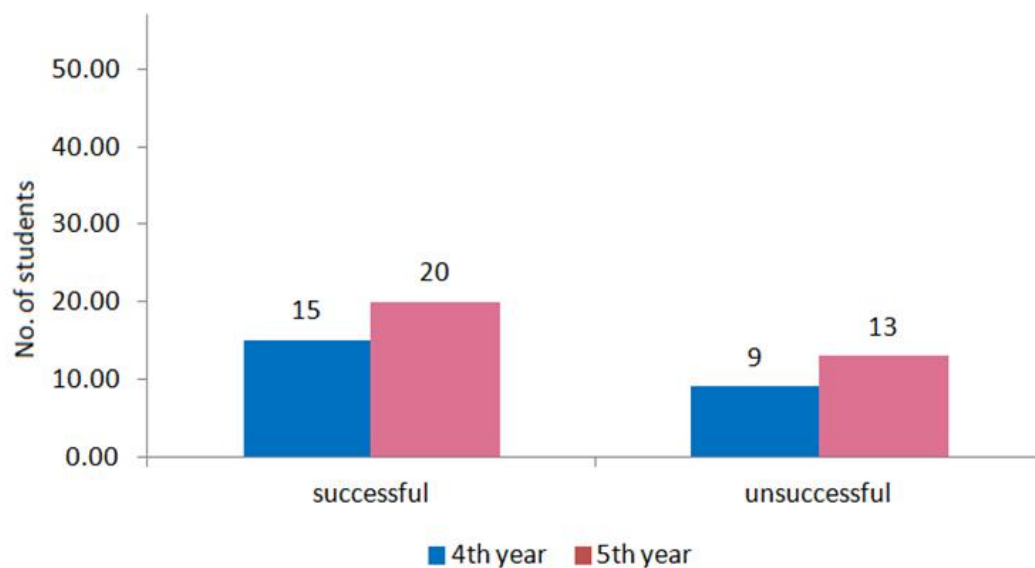


Fig.1 the number of successful and unsuccessful IANB in fourth and fifth years.

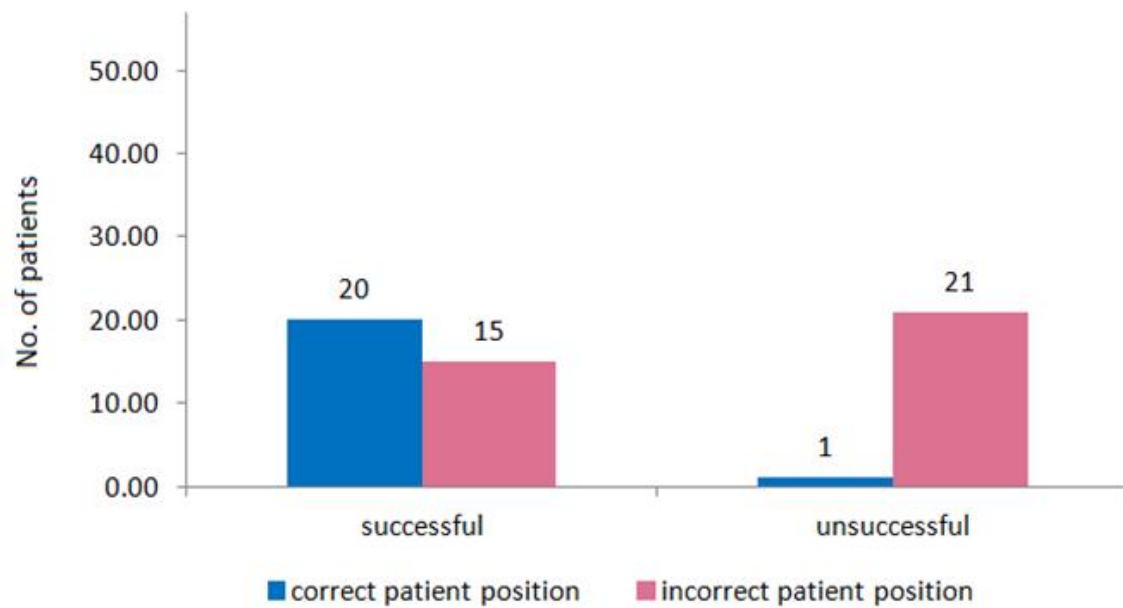


Fig. 2 success of anaesthesia by patient position.

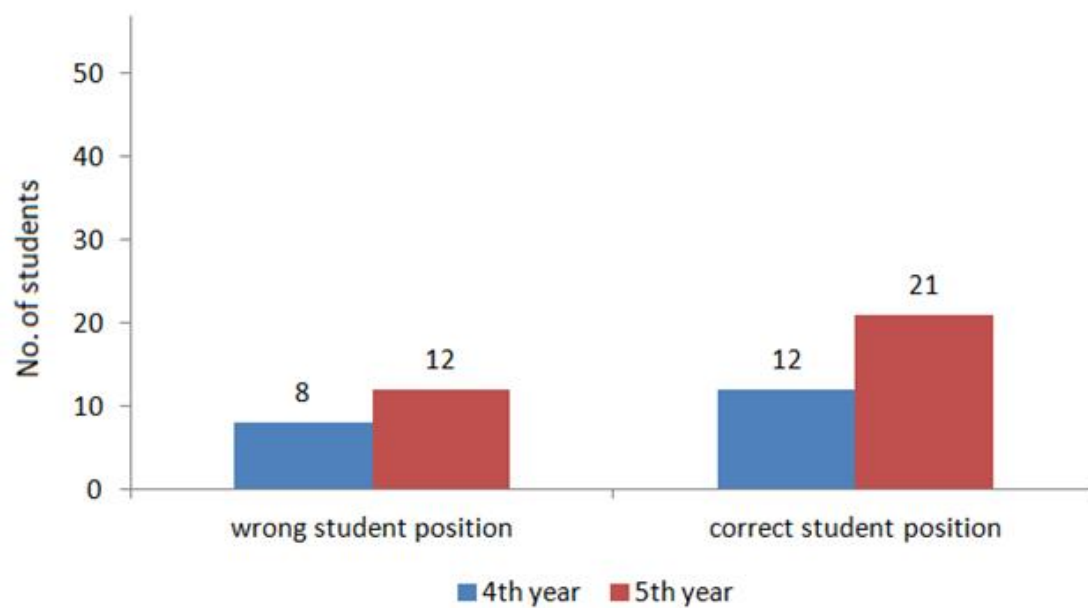


Fig.3 student position by student year